Estimation of Expected Academic Engagement Behaviors: The Use of Vague Quantifiers Versus Tallied Responses

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Introduction

There is little known about how college students estimate expected engagement behaviors and how these estimations relate to past behavioral estimations. This study will specifically investigate the extent to which different estimation provide similar results. This study is based on prior research regarding the importance of academic expectations (e.g., Howard, 2005) and the prior research on estimation of behavior frequency (e.g., Schaeffer & Presser, 2003).

Estimating behavior frequency is difficult, but important in survey research. Surveys that collect data regarding behavior estimates are found in many fields including, but not limited to, those that conduct consumer research, health studies, sexual behavior, drug use, political polls, and many types of education studies. These studies typically use either vague behavioral quantifiers as the response set ("sometimes", "often", etc), or enumerated response sets where the respondent needs to select or tally the target behavior (e.g., "This past semester, how many times did you meet with your advisor?"), or a combination both types. There is evidence that vague quantifiers have some advantages over enumerated (tallied) responses in that they are less cognitively taxing and therefore more easily answered (Lenzner, Kaczmirek, & Lenzner, 2010). However, they also are more difficult to interpret (Wright, Gaskell, O'Muircheartaigh, 1994). For instance, given the difficulty of interpreting what is meant by "often" how do we know that "often" is more than "sometimes" for any given behavior?

Uses of Vague and Enumerated Quantifiers

Surveys of student behavior commonly collect data regarding estimations of behavior frequency in two ways. One way is to ask the respondent to estimate behavior using vague

quantifiers (e.g., “often”). For instance the *National Survey of Student Engagement* (NSSE) published by the Center for Postsecondary Research at Indiana University asks respondents, “During the current academic year, about how often have you . . . worked with other students on projects during class.” Vague response categories include “never,” “sometimes,” “often,” and “very often.” The other way to estimate behavior is the use of enumerated quantifiers where the respondent either selects or enters a numeric value that best represents the estimated frequency of the target behavior. For instance, on the *Beginning College Survey of Student Engagement* published by the Center for Postsecondary Research at Indiana University, respondents are asked “During your last year of high school, about how many hours did you spend in a typical 7-day week doing each of the following?” and then provided with a list of activities and numeric response categories (0, 1-5, 6-10, 11-15, etc). Though collecting survey data regarding estimates of behavior are common practice, they are not without controversy (e.g., Porter, Rumann, & Pontius, 2011). Researchers have noted serious limitations for interpreting data collected using both types of response sets (Schaeffer & Presser, 2003; Wanke, 2002).

Referencing Versus Enumerating When Estimating Behavior Frequency

The process of estimating behaviors using vague quantifiers is distinct from the process used to estimate behavior by trying to tally or count occurrences. Prior research has shown that questions with vague response sets invoke a process of social or behavioral comparison to estimate the behavior frequency (Pace & Friedlander, 1982; Schaeffer, 1991; Wanke, 2002). Though the process goes by different names there is agreement that the process for responding to a vague quantifier involves comparison (Sudman, Bradburn, & Schwarz, 1996; Wright,

Gaskell, & O'Muircheartaigh,1994). In other words, how to estimate how often a respondent participates in an activity always occurs within the context of "often" compared to what or whom? For instance, in a study by Wanke (2002), students were asked how often they go to the movies. One group of students was told the study examines leisure activities of city residents (general population); whereas the second group was told the study investigates the leisure habits of their fellow university students. Students were asked how often they go to the movies using a vague quantifier and then later an enumerated response. Results showed no significant difference in the enumerated response of how often they went to the movies; however there were significant differences in the vague responses between the two reference groups. The study found that "often" was relative to the frequency of the behavior exhibited by the comparison group, whereas the enumerated response was an estimated tally of behaviors not influenced by the comparison group. Other research has shown that respondents also use similar activities, expectations, or other reference points as their comparative anchors when selecting a vague quantifier to estimate their behavior (see Schwarz & Oyserman, 2001).

The other process for estimating behavior is by tallying or counting the occurrences for a set time frame. For instance, "How many times have you met with your academic advisor this current academic year?" This type of question will require the respondent to tally the number of occurrences within a given time frame. This enumeration process involves one or two steps depending on the time frame, behavior frequency, and schedule (fixed or variable) (Brown, 2002; Schaeffer & Presser, 2003). The first step is simply enumeration. Low frequency behaviors regardless of the time frame or schedule, generally involves a straightforward tally of occurrences and are easily recalled. For example, most students can generally count how many

times they failed a test during current academic year. For most students this is a very rare occurrence and, to the extent it happened, they could probably tell you about it with a good deal of accuracy. However as the frequency of the behavior increases, the time frame and schedule become critical variables in the recall process. For instance, tallying how often you asked questions in class over the course of an academic year may be quite difficult for most students. When the respondent is asked to tally such a question, at least two steps are needed to provide a response. The typical strategy involves shortening the time frame to a point where it can be tallied ("I asked questions in class 8 times this past week") then extrapolate to the longer time frame ("Each semester is 15 weeks, we are in week 10 of the second semester for a total of 25 semesters, therefore I asked questions about 200 times since the beginning of the school year"). Brown (2002) refers to this two-step process as enumeration and extrapolation, and as noted by Brown is "more common as presentation frequency increases" (p. 41). However, given the cognitively taxing task of providing enumerated estimates of frequent behaviors over long periods of time, there is evidence that respondents use a strategy referred to as "satisficing" (Blair & Burton, 1987). Schaeffer and Presser describe satisficing as the process of "conserving time and energy and yet producing an answer that seems good enough for the purposes at hand" (p. 68). One example of satisficing is the clumping of numerical estimates around common multiples such as 5 or 10 (Krosnick, Narayan, & Smith, 1996; Huttenlocher, Hedges, & Bradburn, 1990).

Though enumerated responses have the appearance of accuracy, it is important to note that enumerated responses are not necessarily accurate. From cognitive psychology, we know that there are many factors associated with effective encoding and/or effective retrieval of

information (Ashcraft & Radvansky, 2009). Thus forgetting or error in memory can be caused by decay of memory traces over time, interference from other related memory traces, repression (especially for negative events), construction error where the information recalled is inadvertently constructed erroneously which leads to inaccurate recall, situational and environmental cues, and temporary failure to retrieve (Ormrod, 2008). Another important factor regarding enumerated responses is that the accuracy of recalled events presupposes that the individual is making a good faith effort to accurately recall information. For instance, it is well established that men report two to four times more opposite-sex partners as women. It is suspected that men often intentionally misrepresent the number of sex partners as a result of social desirability bias (Brown & Sinclair, 1999).

Given the many difficulties involved with enumerating past behaviors, especially for frequent behaviors over long periods of time, some researchers have suggested that relative, vague judgments of behavior are preferred (Bradburn & Danis, 1984). Sudman, Bradburn and Schwarz (1996) go so far as to say, “Since behavioral frequency reports are error-prone anyway, why bother asking respondents for reports that suggest more precision than they can provide?” (p. 226). However, Sudman, Bradburn and Schwarz (1996) go on to say, “vague frequency expressions carry their own load of problems. . . different respondents use the same term to mean difference objective frequencies of the same behavior” (p. 226).

Estimating Expected Behavior Frequency

Expectations are the result of the interaction of our past experiences with our anticipated environment (Olson, Roese, and Zanna, 1996). Expectations also reflect what we

learn vicariously based on the experiences of others. In an educational context, expectations influence the upcoming choices (major, course selection, etc) students make as their first year of college progresses. As Konings, Brand-Gruwel, van Merrienboer, and Broers (2008) claimed, "Expectations affect students' motivation, engagement, and investment of effort in learning" (p. 536). Given the important role that expectations have regarding future behavior, it is not surprising that many surveys include questions regarding expectations (e.g., Beginning College Survey of Student Engagement). However, given the prior research on the importance of academic expectations (e.g., Howard, 2005) and the prior research on estimation of behavior frequency as described above, there is little known about how students estimate expected behaviors and how these estimations relate to past behavior estimations.

Behavioral expectations (BE) are defined as, "an individual's self-reported subjective probability of his or her performing a specified behavior, based on his or her cognitive appraisal of volitional and nonvolitional behavioral determinants (Warshaw & Davis, 1984, 111). Behavioral intentions on the other hand, are defined as "instructions people give to themselves to behave in certain ways" (Sheeran, 2012, p. 2). The distinction is best highlighted by the example provided by Warshaw and Davis (1985) where a batter steps up the plate facing a very good pitcher. The batter is asked, "Do you intend to hit the ball?", whereby the batter replies, "of course!" The batter is then asked, "Do you expect to hit the ball?" The batter replies, "Probably not." The challenge for survey researchers then is measuring and operationalizing what we mean by expectations and the relationship with actual future behavior. Often expectations are confounded with intentions; which reflects a desired future behavior. This relationship is even less clear when attempting to link estimation of behavioral expectations

with past behaviors. As described by schema theory, our expectations are formed at least in part from our past behaviors in similar situations (Ormrod, 2008). Therefore accuracy of behavioral expectations is part a function of how familiar the situation is with the individual.

For this study, we investigate the process of estimating the relationship of expectations with past high school behavior using vague and enumerated response options. Also of interest is the relationship of behavioral expectations using vague and enumerated responses options. It is assumed that if vague and enumerated estimation strategies are complementary, then there should be a fairly high concordance (e.g., correlation) between the two estimation procedures.

This study will specifically investigate the extent to which different estimation provide similar results.

Research questions include:

1. How consistent are estimations of prior high school and expected first year engagement behaviors as reported with vague quantifiers and reported with tallied responses?
2. Is the relationship between vague and tallied responses for high school behavior the same as for vague and tallied responses for expected first year behaviors?

Method and Data Source

Data for this study are from the 2010 administration of the *Beginning College Survey of Student Engagement* (BCSSE). This survey is administered in the summer/fall to entering first-year students regarding their prior high school experiences, as well as their expectations and attitudes regarding the upcoming first-year experiences. For this study, data from more than 28,000 first-year students enrolled at 68 institutions were included. Respondents included only

those that completed the web version of the survey instrument. Institutions as a whole decide on either web or paper administration of the survey. The survey is administered on site to entering first-year students prior to the start of fall classes. Each of the institutions is responsible for administration of the survey. An approximate response rate can be calculated by dividing the total number of completed surveys by the total number of new, entering first-year students. The overall approximate response rate across institutions was 80%. These institutions included 26% Doctoral, 42% Master's, and 33% Baccalaureate, with about 39% under private control. Approximately 41% of the respondents were male. Of the responding students, 67% were white, 8% were African American, 9% were Latino/Hispanic, and 8% were Asian or Asian American. About 37% of the respondents were first-generation students.

Twelve items from the core survey were repeated at the end of the Web version of the survey for students. These items include, asking questions in class, discussing reading with faculty outside of class, working on project with students outside of class, making class presentation, discussing grades/assignments with faculty, and discussing ideas/readings with other students outside of class. Students were reminded of their original response to the item (the original item is presented with vague quantifiers: Very often, often, sometimes, and never) and were then asked to again estimate their behavior using tallying or counting their behaviors. Students were also asked to indicated the time frame they chose to estimate behavior (day, week, month, term, year)

Student responses to the 12 repeated items were recoded so that all responses were on a per week basis. Students could report frequency based on five options (per day, week, month, academic term, and academic year). Week was taken as the baseline and responses with other

time frames were adjusted by appropriate multipliers (day = 5, week=1, month = .25, academic term = .111, and academic year = .028).

Results

Research question 1: How consistent are estimations of prior high school and expected first year engagement behaviors as reported with vague quantifiers and reported with tallied responses?

Correlations between high school behavior and expected first-year behavior for vague responses ranged from .334 to .512. Correlations between high school behavior and expected first-year behavior for tallied responses ranged from .440 to .533. In all instances, for each behavior the tallied correlation was higher than the vague correlation. Overall, there tends to be a higher correlation between past and expected behaviors when students are asked to tally or count their behaviors versus use of a vague estimation (see table 1). The paired-sample t-test indicated that for 3 of the 6 behaviors, there was a consistency in mean score differences between use of vague and tallied responses. In other words, for both estimation procedures, estimated expectations were significantly higher than past high school behaviors. However, the magnitude of the differences (effect size was calculated using a pooled standard deviation for both research questions), the differences for the vague estimations were much larger than the tallied. There was also a couple of instances where the two estimation procedures produced significant mean difference results between high school and expected first year, but in the opposite directions (discuss grades with faculty and discuss ideas outside class with others).

Research question 2: Is the relationship between vague and tallied responses for high school behavior the same as for vague and tallied responses for expected first year behaviors?

In other words, using tallied data, does "sometimes" in high school correspond to "sometimes" when estimating expected first year behaviors? In only one was there no significant difference (see table 2 for details). For the question regarding how often they made (or expect to make) class presentations, “often” in high school and expected often in their first year both corresponded with a tallied count of 1.0. In all other instances, the mean differences were significant with varying magnitude. For instance, in high school “very often” asking questions in class corresponded with a tallied count of this activity of 23 times per week. However, “very often” expecting to ask questions in class during their first year of college corresponded with a mean of 16 times per week (M_{diff}=6.89; t=39.708; d_{pooled}=.550). In another example with a much smaller difference, in high school “very often” making class presentations corresponded with a tallied count of this activity of 1.3 times per week. However, “very often” expecting to make class presentations during their first year of college corresponded with a mean of 1.2 times per week (M_{diff}=.13; t=6.827; d_{pooled}=.141).

Table 1. Correlation and differences in estimates of prior high school and expected first year engagement behaviors as reported with vague quantifiers and tallied responses.

Items	Format	Mean St. Dev.	High School	College Expectation	r	n	T-test Sign.	Effect Size
Ask Questions	Vague	M	3.21	3.20	.51	30680	***	.01
		SD	.80	.74				
	Tallied	M	15.58	11.50	.53	26223	***	.35
		SD	13.05	9.91				
Class	Vague	M	2.75	2.83	.40	30323	***	-.11

Presentations		SD	.76	.73				
	Tallied	M	.80	.87	.53	27042	***	-.09
		SD	.75	.79				
Discuss grades w/ faculty	Vague	M	2.68	2.97	.44	30472	***	-.36
		SD	.82	.78				
	Tallied	M	1.65	1.61	.52	27222	***	.02
		SD	2.00	1.83				
Worked w/classmates outside class	Vague	M	2.38	3.02	.33	30457	***	-.81
		SD	.82	.77				
	Tallied	M	1.02	1.79	.44	27222	***	-.54
		SD	1.24	1.60				
Discuss ideas outside class w/faculty	Vague	M	2.14	2.66	.39	30463	***	-.60
		SD	.90	.84				
	Tallied	M	1.32	1.52	.44	26249	***	-.12
		SD	1.91	1.54				
Discuss ideas outside class w/others	Vague	M	2.59	2.88	.49	30303	***	-.35
		SD	.87	.78				
	Tallied	M	2.86	2.73	.51	25865	***	.04
		SD	3.20	2.50				

*** p<.001

Table 2. The relationship between vague and tallied responses for high school behavior for vague and tallied responses for expected first year behaviors.

		High School			College Expectation				
Items	Responses	M	SD	N	M	SD	N	Sig	ES
Ask Questions	Very often	23.02	14.94	11842	16.13	10.49	9779	***	.55
	Often	15.39	12.49	10399	10.89	9.12	12112	***	.40
	Sometimes	7.41	8.57	5926	5.28	6.49	5197	***	.29
	Never	2.32	5.27	328	1.39	3.99	158	*	.22
Class Presentations	Very often	1.30	.92	4725	1.17	.92	4717	***	.14
	Often	.98	.77	11929	.97	.82	11582		.00
	Sometimes	.49	.49	11459	.69	.68	11013	***	-.34
	Never	.08	.29	517	.50	.69	494	***	-.83
Discuss Grades	Very often	3.19	2.62	1258	2.65	2.37	7386	***	.12
	Often	2.14	2.09	10534	1.71	1.76	8265	***	.23
	Sometimes	.89	1.25	12170	.81	1.14	8265	***	.07

	Never	.17	.72	1258	.42	1.24	318	***	-.36
Worked w/classmates outside class	Very often	2.26	1.58	2669	2.68	1.77	7599	***	-.18
	Often	1.66	1.38	7940	1.87	1.51	12606	***	-.13
	Sometimes	.71	.93	14932	.92	1.10	6745	***	-.25
	Never	.11	.47	3107	.25	.76	454	***	-.37
Discuss ideas outside class w/faculty	Very often	4.01	2.91	2316	2.74	1.81	4528	***	.47
	Often	2.68	2.32	5564	1.93	1.52	9245	***	.35
	Sometimes	1.09	1.48	13438	.97	1.10	11933	***	.10
	Never	.16	.75	7034	.22	.73	1506	**	-.10
Discuss ideas outside class w/others	Very often	6.56	4.21	4185	4.86	4.15	6002	***	.37
	Often	4.08	3.35	9430	3.22	3.35	12416	***	.24
	Sometimes	1.64	2.13	12180	1.87	2.60	8946	***	-.11
	Never	.30	1.33	2254	.74	1.86	627	***	-.38

*** p<.001, ** p<.01, * p<.05.

Discussion

The results of this study are of significance to any higher education researchers that use survey data. This study sheds light on a previously unexplored area: do different behavior estimation procedures for past and expected behaviors produce different results? One of the general findings of interest is that the use of vague quantifiers seems to be associated with larger differences between past behavior and expected behavior than use of tallied data. In other words, those doing “gap analysis” where data are used to identify areas where student expectations are not met, may want to consider how their results may differ if their response

categories were changed. It maybe that the magnitude of the gap is more of an artifact of the response set, then any real gap in behavior.

As suggested in previous studies, tallying the frequency of activities employ more cognitive effort and maybe more susceptible to errors. In this study, we added one more complexity to this cognitive effort with adding expected frequency. The expectations are shaped by past behavior and anticipated environment (in this context: first-year of college). This survey was completed mostly during the first couple of weeks. Around this time, students' expectations could have been shaped by orientations, syllabi, and course schedules that are given by that time. From this study, we see that students extrapolating future activities generally do not match with their past activity tallies.

Maybe higher correlations in the enumerated sets are due to more variability tallied response set. There are only four options in the vague response set while the tallies were open- ended.

One limitation of our study is we look at this problem only from vague to tally conversion: We first ask students how often they did, or they expect to do and then we ask them you said "sometimes/often/very often", how many times you did or expect to do this activity per week/month/academic term? We might orient or set students to think one way in this type of experiment. What would be the results like if we had half of the students in other way? First ask them how many times they did or expect to do an activity, and then ask it how often they did?

For further study, researchers could look at if some of these gaps are related to academic rigor of the high school or academic rigor expectation of the college students attend. Maybe couple of highly selective colleges and open enrollment colleges and university students could be selected to check if there is any variation in interpretation due to academic rigor of the environment as some of these behaviors relate to academic rigor.

For further study, we can look at the latent mean differences between tallied response and vague responses. The latent mean differences would account for the measurement errors in both methods.

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